

## Technical Description

The brief circuit description is listed as below:

- 1) U6 acts as MCU (LCD Controller/Driver with speaker)(GPLB62200A)
- 2) U1 acts as LCD Driver (GPLD2120A).
- 3) U2 acts as RFID Reader (W55MID50).
- 4) U4 acts as Sound Controller (GPCE2064A)
- 5) Y1 act as Crystal Oscillator (13.56MHz) for U2.
- 6) Y2 acts as Crystal Oscillator (32.768kHz) for U4.
- 7) Y3 acts as Crystal Oscillator (24MHz) for U6.
- 8) M1 acts as Motor.
- 9) U5 acts as Voltage Regulator.
- 10) U7 acts as EEPROM.
- 11) U8 acts as CMOS Flash IC.

**Antenna Type: Internal antenna**

**Antenna Gain: 0dBi**

**Maximum allowed field strength of production tolerance:  
from 48 dB $\mu$ V/m to 54 dB $\mu$ V/m at 3m**



# Winbond *MFID<sup>WB</sup>* Reader

## W55MID50

## Data Sheet



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## General Description

Winbond *MFID<sup>WB</sup>* (Magnetic Field Identification) series is used in all areas of automatic data capture allowing contactless identification of objects using magnetic field. From ticketing to industrial automation and access control, the applications of MFID are burgeoning. In recent years automatic identification procedures have become very popular in many service industries, purchasing and distribution logistics, industry, manufacturing companies and material flow systems.

W55MID50 is one of series in Winbond *MFID<sup>WB</sup>* family that supports multi-functional Reader solution and especially focus on toy, security, and consumer related applications. The applications with

Winbond *MFID<sup>WB</sup>* Tag series such as W55MID10 that provides read-only mask ROM-ID version transponder for mass production solution in toy industrial, meanwhile W55MID15 provides the other solution for manufacture option, which is 243 bonding-ID selection transponder. Besides the single tag transponder application, W55MID35 offers multi-transponder recognition function for intelligent and smart toy applications.

W55MID50 provides a wide variety of applications for toy, security, and consumer market meanwhile the W55MID50 is the most cost effective solution on current *MFID<sup>WB</sup>* related application market.

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### 1.1 W55MID50 Features

- ❑ Magnetic field resonance frequency: 13.56MHz
- ❑ Data clock: 22 ~ 66KHz
- ❑ Inductive coupled power supplies for transponder's no battery operation
- ❑ On-chip rectifier, voltage limiter, clock extraction, power management, uC interface
- ❑ Provides NRZ and Manchester coding data format
- ❑ Adjustable 4-level of Reader transmission power selection
- ❑ Provides serial and parallel mode uC interface
- ❑ uC data output rate  $\geq$  1Mbps
- ❑ Low power, low voltage operation
- ❑ Supports power-down mode  $\leq$  1uA
- ❑ Operating distance: 0 ~ 10cm
- ❑ Operating voltage: 2.4V ~ 5.5V
- ❑ Operating temperature: 0 ~ 70 °C
- ❑ Package: Dice form, PDIP-20, SOP-20
- ❑ Reference design PC board Size: 2.0x2.0cm<sup>2</sup> (without PCB antenna)
- ❑ Winbond patented "Automatic Reader Transmission Power Adjustment" for Reader optimum transmission power adjust
- ❑ Minimize external components

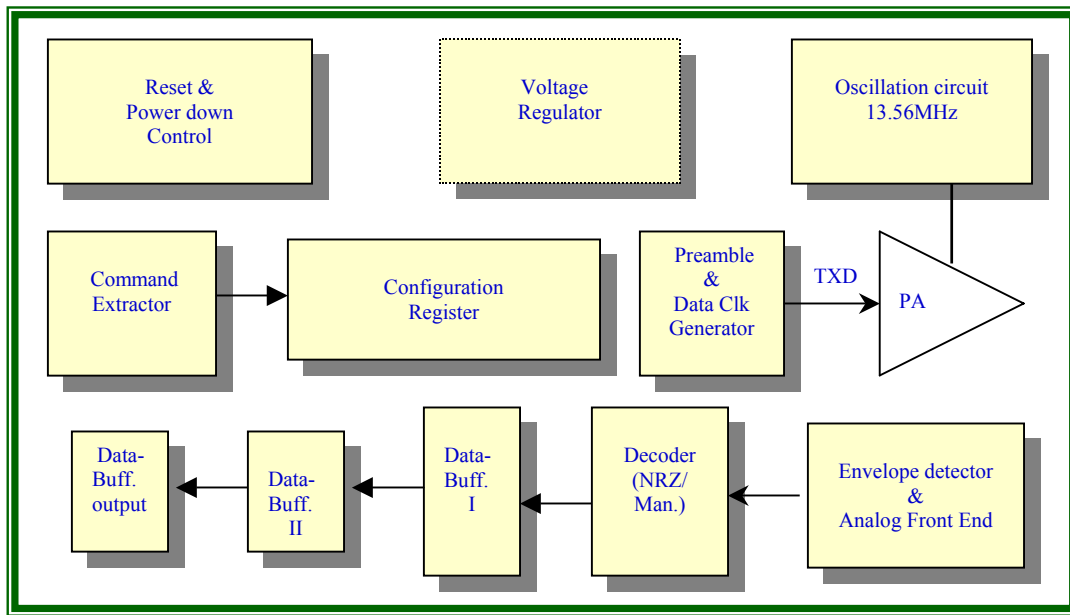


## 1.2 W55MID50 Pin Description

Symbol	PAD No.	I/O	Functional Description
D3	1	O	Data output #3
D2	2	O	Data output #2
D1	3	O	Data output #1
D0	4	O	Data output #0
XIN	5	I	Connect to external 13.56MHz oscillator
XOUT	6	O	Connect to external 13.56MHz oscillator
VSS	7	GND	Digital power return path
CMD	8	I/O	R/W configuration register
CLK	9	I	Command R-W/ Read data clock
VDD	10	Power	Power path
RX_VDD	11	Power	Power path of Rx
RX_VSS	12	GND	Power return path of Rx
ENV	13	I	Envelope detector input
RESET	14	I	Reset
TagIn	15	O	Indication of tag arrival
COIL	16	O	PA output to connect with PCB antenna
TX_VSS	17	GND	Power return path of PA
TX_VDD	18	Power	Power path of PA

# System Description

## 2.1 W55MID50 System Block Diagram



## 2.2 W55MID50 Functional Description

### Transmission Power Amplifier (PA)

It provides 4 different selectable transmission power for Reader chip to support *MFID<sup>WB</sup>* Tag's radiation power supply. The external inductor coupling circuit is designed for 13.56MHz magnetic field resonance. The coupled center frequency will depend on equivalent value of external PCB inductor and capacitor.

### Envelope Detector & Analog Front End

The major function of this unit provides *MFID<sup>WB</sup>* Tag's data can be extracted.

### Voltage Regulator

The voltage regulator generates the system needs of device power supply.

### Configuration Register

System configuration register controls the all functional settings of W55MID50 such as Tag data



format, Tag detection cycle, output data format, and PA transmission power selection.

### **Reset and Power-down Control**

The function of system power-down control mode is normally used for power consumption saving.

### **Crystal Oscillation**

The 13.56MHz system clock generator generates the need of device system clock.

### **Decoder NRZ/Manchester**

This unit is in charge of Tag data format decoder, which can provide Tag-ID data format decoding of NRZ or Manchester.

### **Data Buffer and Output**

This unit buffers the Tag-ID data, which is under de-frame processing.



# Electronic Characteristics

## 3.1 W55MID50 Absolute Maximum Ratings

Parameter	Rating	Unit
Maximum Current in COIL	10	mA
Power Dissipation ( $T_a = 70^\circ\text{C}$ )	100	mW
Ambient Operating Temperature	0 to +70	$^\circ\text{C}$
Storage Temperature	-40 to +85	$^\circ\text{C}$

*Note:* Exposure to conditions beyond those listed under Absolute Maximum Ratings may adversely affect the life and reliability of the device.

## 3.2 W55MID50 DC Characteristics

(VDD-VSS = 4.5 V,  $T_a = 25^\circ\text{C}$ ; unless otherwise specified)

Parameter	Sym.	Conditions	Min.	Typ.	Max.	Unit
Operating Magnetic Field	$f_{OP}$	Field in resonation	-	13.56	-	MHz
Operating Voltage	$V_{DD}$	Field in resonation	3	-	5.5	V
Operating Temperature	$T_{amb}$	Ambient operating temp	0	25	70	$^\circ\text{C}$
Operating Current	$I_{OP}$	$f_{OP} = 13.56\text{MHz}$	-	22	-	mA
Stand-by Current	$I_{SB}$	Power Down mode enter	-	0.7	1	$\mu\text{A}$
Sink Current	$I_{SK}$	$V_{oL} = 0.3V_{DD}$	-	10	-	mA
Source Current	$I_{SR}$	$V_{oH} = 0.7V_{DD}$	-	-6	-	mA

## 3.3 W55MID50 Ordering Information

W55MID50 provides two types of package in shipment: Dice form, PDIP-20, SOP-20, and Wafer

Part Number	Package	Remarks
W55MID50	Dice form	
W55MID50	PDIP-20	
W55MID50	SOP-20	
W55MID50	Wafer form	MOQ required





## 3.4 FAQ

- Q.** What "MFID<sup>WB</sup>" means?
- A.** "MFID<sup>WB</sup>" Magnetic Field Identification, which is a Winbond contactless identification chip product series. There are many application, architecture, and circuit design patented by Winbond.
- Q.** What different between W55MID15 and W55MID35?
- A.** W55MID15 is a single-tag application without "Anti-collision" algorithm build-in. W55MID35 is a multi-tag application with "Anti-collision" algorithm build-in.
- Q.** What is the operating frequency?
- A.** Both W55MID15 and W55MID35 are operating on 13.553MHz ~ 13.567MHz ISM.
- Q.** Does W55MID50 Reader IC pass FCC compliance testing?
- A.** W55MID50 pass FCC compliance test of Section 15.209 and Section 15.225.
- Q.** How are W55MID15 and W55MID35 IDs generated?
- A.** W55MID15 and W55MID35 IDs are generated by manufacturing bonding option of pads RS0 ~ RS4.
- Q.** How many W55MID15 and W55MID35 IDs are generated?
- A.** There are total 243 bonding option IDs for W55MID15 and W55MID35.
- Q.** How are W55MID15 and W55MID35 IDs read?
- A.** W55MID50 is a function of MFID Reader IC. W55MID15 and W55MID35 automatically respond with its ID when it is coupled by magnetic resonance power from Reader.
- Q.** Is it possible to read multiple MFID<sup>WB</sup> chips in the same magnetic area?
- A.** W55MID35 has been implemented by "Anti-collision" algorithm to allow more than one IDs can be simultaneously recognized in the same magnetic area.
- Q.** How many W55MID35 IDs can be simultaneously read in the same magnetic area?
- A.** Actually, there is no any limitation in total number of W55MID35 tags can be simultaneously read, if the Reader system can provide sufficient coupled magnetic resonance power to every W55MID35 tag,
- Q.** Does anything interfere with MFID chip readout operation?
- A.** W55MID series is operating on 13.553MHz ~ 13.567MHz, therefore it is far away from 27MHz and 2.45GHz. There is no any interference with W55MIDseries.

## 3.5 W55MID50 Data Sheet Document History

Revision	Date	Description
A0	2002/9/15	Preliminary version
A1	2002/12/29	Pin functional description update
A2	2003/2/7	General description update
A3	2003/3/23	FCC compliance testing report